

The Molera Road Experimental Treatment Wetland



The Watershed Institute at California State University Monterey Bay
Central Coast Wetlands Group at Moss Landing Marine Labs



Introduction

In 2005 the Molera Road Treatment Wetland was designed and constructed by researchers from CSUMB, MLML, and the Monterey RCD to study the effectiveness of a constructed treatment wetland at reducing pollutant concentrations in surface water contaminated with agricultural runoff. Constructed treatment wetlands are man-made versions of natural wetlands, designed to emphasize specific physical and biological characteristics to improve treat-

ment capacity. The Molera Road Wetland operates as an **off-line, downstream experimental watershed pollution treatment** system. The water is pumped from the Tembladero Slough, treated through the two phase system, and allowed to return to the slough. Water returning to the slough has been shown to be much lower in nutrient and pesticide concentrations. Reduction rates and load characterization studies are ongoing by the Watershed Institute.



Molera Road wetland is an experimental off-line pollution treatment wetland.



Photographic timeline of the construction and establishment phase.

Project Summary

Overview: The Molera Road Treatment Wetland is a small parcel of county-owned land operated as an experimental research facility to study pollutant removal potential of a constructed wetland using waters with high pesticide and nutrient concentrations.

Location: Confluence of Tembladero Slough and the Old Salinas River Channel, near Castroville.

Dimensions: Site area: 1.5 hectares (3.5 acres). Sinuous channel length: 285 meters.

Configuration: Water is pumped continuously into the wetland from Tembladero Slough. Water flows through the sinuous channel, then the low gradient polishing wetland, before draining back into the Slough.

Operated by: Staff and students at the Watershed Institute at CSUMB and the Central Coast Wetlands Group at Moss Landing Marine Labs.

Timeline: Idea conceived 2002. Construction Fall 2005. Gasoline-pumped from 2006. Solar-pumped 2007-2008. Gasoline-pumped again in 2009. PG&E electrical hookup established 2010.

Funding: Various grants, including: SWRCB Prop 13, SWRCB PRISM, NOAA SeaGrant, CA DFG, CA Dept. Pesticide Regulation, MCWRA in-kind, CSUMB Internal funds, MLML internal funds.

Other partners: RCD Monterey County, CA Coastal Commission, Monterey Water Resource Agency

Project Results

Nitrogen results to date:

The wetland reduces the concentration of nitrate by 5 to 20 mg/L depending on the residence time. Much of the nitrate is removed permanently through denitrification, becoming an atmospheric gas.

Pesticide results to date:

Diazinon concentrations have been reduced as the water flows through the wetland, particularly when the initial inlet concentrations in the Slough water are high (>200 ng/L).

Toxicity:

Toxicity to invertebrates has been observed to be reduced as water moves through the wetland.

Pathogen results to date:

Protozoan pathogens (Giardia etc.) have been observed only at very low counts in the inlet from the Slough, so no direct inference can be made yet about how well the wetland might reduce protozoan pathogen counts. Bacterial pathogens (coliforms etc.) have been observed in the inlet from the Slough at high counts typical of the region.

Suspended sediment:

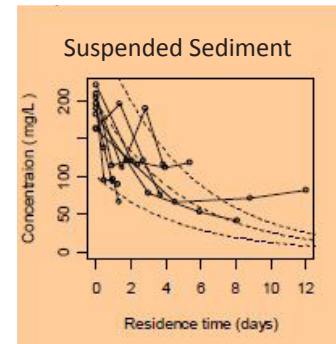
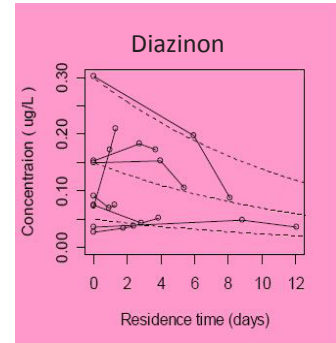
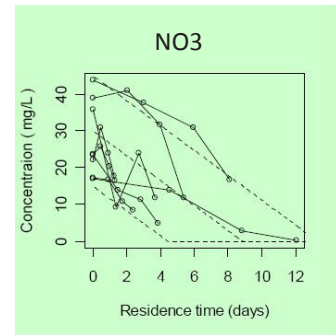
Suspended sediment concentrations were consistently reduced.

Sedimentation results to date:

Aggradation over the length of the channel has averaged zero in the 5 years since pumping began. Aggradation in the sediment trap at the start of the channel has been about 20-30 cm, as designed. Excavation of the trap has been completed once and may be required in a couple of years.

Cost results to date:

- Operating costs - \$80 per month to PG&E, for daily average pumped input of about 17 GPM (27 AF/yr)
- Cost of PG&E hookup (transmission-pole-mounted transformer) - \$17K.
- Cost of installation of the previous 1kW solar system - \$10K, paid twice, and stolen twice.
- Costs of various pump & plumbing configurations - \$5K.
- Cost of initial construction (grading) - \$40K. Costs of initial design, permitting, and native plant restoration - \$100K. These costs are not indicative of initial costs that would be incurred in an on-farm setup.



graphs from from Harris et al. 2007



Current and potential CCWG Water Quality and Habitat Enhancement Projects in North Monterey County

Implementation Options

To make a substantial impact on the watershed nutrient load, an operational treatment wetland (i.e. non experimental) with similar characteristics to the Molera Road Wetland would need to be much larger, perhaps 10 to 100 times larger; or the watershed would need to be smaller.

An alternative application of wetlands with similar characteristics to the Molera Road Wetland would be **inline, at-source pollution treatment**. An example would be installations adjacent to farm blocks with problematic tailwater nutrient loads, in a similar configuration to how sediment detention basins are currently deployed on farms.

For more information please visit:
www.centralcoastwetlands.org (lead: R. Clark) or
www.ccows.csumb.edu/home (lead: F. Watson)